Question: How many damaged hemlocks per acre are there in the State today compared to when the problem was first discovered?

The first detections of HWA in North Carolina were recorded in 1995. From the time of the first detections until 2002, there was no reported hemlock mortality and the adelgid was thought to be spreading very slowly. By the end of 2002, adelgid infestation was documented in 19 mountain counties. Infestations were considered to mostly be light and scattered and no hemlock mortality was recorded. While scattered mortality may have been present as early as 2005, widespread mortality was not observed until around 2007 in the counties that were previously infested. By summer, 2010, all counties within the historic range of hemlocks in the state were infested. (NCFS HWA Report, 2010.)

Given the lack of information about the quantity of hemlocks in North Carolina prior to HWA-infestation in 1995, it is nearly impossible to accurately determine the degree of damage that has occurred in our state since that time. However, we can reasonably presume that the damage on state lands in North Carolina is comparable to that reported on nearby national park lands, where more studies have been conducted.

Scott Abella (2014) states that in the Great Smoky Mountains National Park, 80% of hemlocks showed a decline in health 5 years post documented infestation. Over an 11-year period in Shenandoah National Park, the percentage of healthy hemlock trees evaluated dropped from 80% to near 0%, with 49% mortality.

Dharmadi et al. (2019) stated that "scientists at Coweeta Hydrologic Laboratory have been monitoring the effects of HWA, and the decline of *T. canadensis*, on functional attributes and vegetation dynamics of riparian forest plots since HWA was first noticed in 2003 (Elliott and Vose, 2011)… "In this region, HWA infestation was detected in 2003, with mortality reaching 97% by 2014."

Despite observed mortality, hundreds of thousands of hemlocks remain on the landscape on public and private lands. This is where efforts to stabilize the loss of hemlocks are occurring. Recent intervention in the form of chemical and biological control is effectively conserving hemlock genetic diversity on site across the range of eastern and Carolina hemlocks in North Carolina. With funding and support from the NC General Assembly, the NCDA&CS, and the USFS Forest Health Protection program, the reported number of hemlock trees receiving chemical protection on state lands across North Carolina has increased from 10,400 in 2015 to 44,160, as of end of 2018. This escalation has been due to the increased attention and priority given to the issue as a result of the creation of the Hemlock Restoration Initiative in 2014 by Commissioner Steve Troxler, which has facilitated a growth in capacity across all three state agencies.

	Total trees reported as chemically treated before & after HRI began*			Site-specific example of increase in no. of trees protected since inception of Hemlock Restoration Initiative		
	2007-2015	**2016-2018**			**2007-2015**	**2016-2018**
NCFS	1,378	27,566		DuPont SRF	475	2,952
NCParks	7,134	6,475**		Hanging Rock SP	625	2,523
NCWRC	1,378	10,121		Sandy Mush GL	63	1,231
Non-State Lands	50	4300				

* Note: So far in 2019, thousands of additional trees on state lands have been treated, but totals have not yet been compiled.
** Does not include all NCParks treatments for 2016-2018.

The state's biological control program has advanced substantially in the past four years. HRI has successfully garnered funds from diverse sources to expand the number of predator beetles brought into the state, and has directed a large portion of those funds towards a state-run rearing facility which will improve the sustainability of the program into the future. HRI's monitoring and redistribution efforts have resulted in confidence in the successful survival, establishment and dispersal of the target beetle populations in multiple locations across the western portion of the state.

The impacts of hemlock decline extends beyond our public lands. Since its inception, HRI has engaged with over 1300 individuals in 30 NC counties. Through our outreach, educational presentations, trainings, and volunteer opportunities, private land owners are increasingly able to participate in responsible hemlock management on non-state lands. We frequently receive positive, albeit informal, reports from individuals who have used the information and resources we have made available to successfully treat their own trees, and sometimes their neighbors' as well.

While we have made great strides in short time, more remains to be done to ensure the long-term recovery and survival of this keystone tree species. We have built the foundation of a strong, collaborative program that will continue to yield impressive results if adequately funded.